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U. S. DEPARTMENT OF AGRICULTURE.

OFFICE OF ROAD INQUIRY.

BULLETIN No. 6.

INFORMATION

REGARDING

ROADS, ROAD MATERIALS, AND FREIGHT RATES

IN CERTAIN STATES NORTH OF THE OHIO RIVER.

(FURNISHED BY OFFICIALS OF VARIOUS RAILWAY COMPANIES.)

PUBLISHED BY AUTHORITY OF THE SECRETARY OF AGRICULTURE.

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LETTER OF TRANSMITTAL.

U. S. DEPARTMENT OF AGRICULTURE,
OFFICE OF ROAD INQUIRY,

Washington, D. C., April 2, 1894.

SIR: The accompanying information has been supplied by officials of various railway companies in reply to a circular of inquiry sent out by this office, under date of October 16, 1893, asking railroad managers for information in regard to the supply of good road materials—accessibility, reduced rates of transportation, etc.—along their respective lines. Their letters contain valuable suggestions and details which will be of special interest to the sections from which they come, and their publication is respectfully recommended.

Very respectfully,

Roy STONE,
pecial Agent and Engineer in Charge.

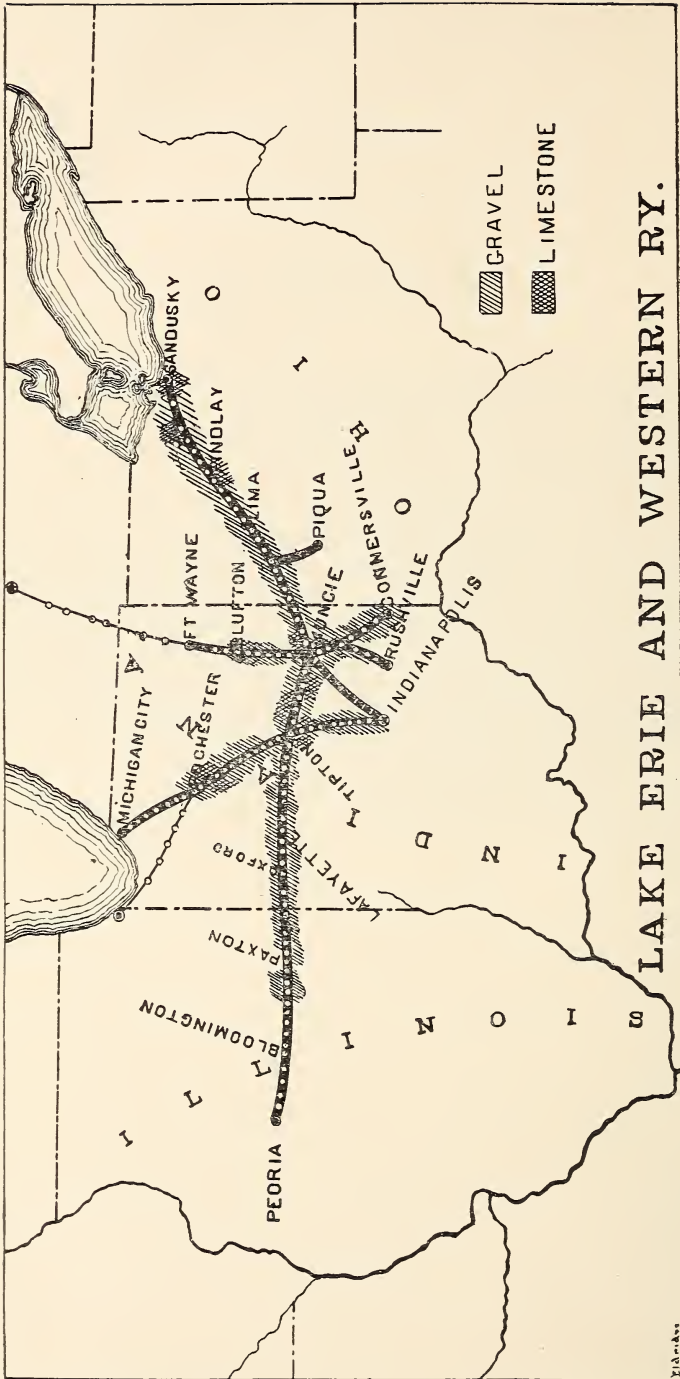
Hon. J. STERLING MORTON,
Secretary.

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ROAD MATERIALS AND TRANSPORTATION RATES IN CERTAIN STATES NORTH OF THE OHIO RIVER.

LAKE ERIE AND WESTERN RAILROAD COMPANY.

(Furnished by T. H. Perry, chief engineer and purchasing agent, Indianapolis, Ind.)

Complying with your request of the 3d instant, for information regarding the supply of good road materials along or near our lines—their location, character, accessibility, and cost of preparation and loading on cars—I would state that our resources are abundant, consisting chiefly of excellent quality of gravel, many beds of which, however, are as yet undeveloped. Of higher class of material used, more especially for streets in cities and towns, we have building and curb stone, crushed and broken stone for paving and concrete, hard paving brick, all of which are produced in unlimited quantities; also abundant quality of sand of various grades, suitable for road-making and other purposes, all of which are found at various stations along our lines, but more specifically as follows:

At Sandusky, Ohio.—Broken or crushed stone, \$1 per cubic yard; lake sand, 30 cents per cubic yard delivered on cars.

At Castalia, Ohio.—Several gravel pits and shell-rock beds, from which country roads in vicinity are made; can be put on cars for 30 cents per cubic yard.

At Fremont, Ohio.—Gravel or broken stone (spalls and gravel), any quantity on cars for 20 cents per cubic yard; limestone, \$1.25 per cubic yard.

At Kansas, Amsden, Fostoria, Findlay, Rawson, and Bluffton, Ohio.—Broken or crushed limestone and gravel, 25 to 50 cents per cubic yard; limestone, \$1.25 per cubic yard; curbstone, 8 cents per linear foot.

At St. Marys, Ohio.—Gravel, in limited quantities, 60 cents per cubic yard delivered on cars by wagons.

At Fort Recovery, Ohio.—Good gravel pits which are developed and have track facilities. Gravel delivered on cars, 30 cents per cubic yard.

At Portland, Ind.—Near Salimonia River good gravel beds are developed and gravel can be put on cars by wagons for 65 cents per cubic yard; also broken limestone for \$1.25 per cubic yard; with track facilities, and in large quantities, can be produced for 30 cents and \$1 per cubic yard, respectively.

At Muncie, Ind.—A gravel bank of excellent quality, covering 25 acres, located 1 mile north from railroad, that can furnish 50,000 to 80,000 car loads of gravel, not developed; with track facilities, modern excavating appliances, and in larger quantities, can be put on cars at this station for 20 cents per yard; crushed stone for concrete, \$1 per cubic yard; sand, 90 cents per cubic yard, delivered on cars.

At Gilman, Alexandria, and Orestes, Ind.—Gravel, broken stone, sand, curbing and limestone in unlimited quantities. Gravel banks one-half mile from railroad. No track facilities. Large quarries with track facilities are developed. Gravel and sand delivered by wagon, 50 cents per cubic yard; curbing, 8 cents per linear foot; crushed and broken stone, 50 cents to \$1 per cubic yard on cars.

At Hobbs, Tipton, Hillisburg, and Mulberry, Ind.—Gravel found in limited quantities in creek bottoms one-half to 1 mile from track. No track facilities, delivered by wagon; 50 to 75 cents per cubic yard on cars.

At Dayton and Lafayette, Ind.—Inexhaustible quantities of sand and gravel within 1 mile from stations. Some pits at Lafayette have track facilities. Can be put on cars for 20 cents per cubic yard at either point in large quantities and with the use of steam excavator and loader. Sand and gravel delivered by wagon at 50 cents per cubic yard on cars at Dayton.

From Montmorenci, Ind., to Gibson, Ill.—Gravel found in creek bottoms in limited quantities. No track facilities. Delivered by wagon on cars at station at 50 to 75 cents per cubic yard.

At Saybrook, Ill.—Large quantities of gravel and sand along Sangamon River, one-half mile from railroad. No track facilities. By wagons, 50 cents per cubic yard; with track facilities and steam excavator and loader could be put on cars for 20 cents per cubic yard.

At Bloomington, Ill.—Good paving brick, \$8 to \$10 per 1,000 on cars.

At Noblesville, Ind.—Abundant quantities of gravel and sand; some pits developed. Only one pit has track facilities. Cost, 30 to 50 cents per yard on cars.

At Sharpsville, Fairfield, and Bunker Hill, Ind.—Gravel in quantities is found within 1 mile from railroad. No track facilities. By wagon, 50 to 65 cents per cubic yard on cars.

At Peru, Ind.—Abundance of good gravel, sand, and lime stone within 1 mile and less of railroad. Quarries and gravel pits developed. Track facilities to quarry. One gravel pit one-quarter of a mile from railroad would furnish 50,000 car loads with track facilities and steam shovel; the gravel can be produced for 20 cents per cubic yard.

At Deedsville, Rochester, Tiosa, and Plymouth.—Gravel in large quantities from 1 to 2 miles from railroad. No track facilities. Road supervisors pay 50 cents per cubic yard for gravel hauled by wagons on public roads all distances within 3 miles. Delivered by wagon on cars would cost about 60 cents per cubic yard.

At Roeskeys, Ind.—Good paving brick, \$8 per 1,000.

At Michigan City, Ind.—Inexhaustible quantities of fine sand, 12 cents per cubic yard on cars.

At Connersville and New Castle, Ind.—Good gravel, limited quantities, 40 to 50 cents per cubic yard on cars, hauled by wagons.

At Milton, Ind.—Excellent gravel beds along White River, not developed; one-half mile from railroad. Hauled by wagons for 60 cents per cubic yard.

At Springport, Ind.—Gravel in large quantities; easy access; can be loaded on cars by wagons for 35 cents per cubic yard.

At Mount McCowen, Ind.—Abundant quantity of good gravel from 1 to 3 miles from railroad. From pits that are now developed gravel could be loaded on cars for 60 to 70 cents per cubic yard. It is probable some pits can be developed nearer railroad, which would materially decrease cost with present facilities.

At Eaton, Ind.—Broken stone spalls, 30 to 40 cents per cubic yard on cars.

At Montpelier, Ind.—Limestone quarries, developed and have track facilities; building stone, \$1.50 per cubic yard; broken stone, 25 cents to \$1 per cubic yard.

Under question (4) I desire to offer a suggestion to promote success of road improvements, and that is, to educate the boys how to make and maintain good roads. In all the country cross-road schools some of the most advanced pupils should be selected and taught the fundamental principles and great importance of good roads and instructed how to improve and maintain them. One of the chief obstacles in the way of advancement towards perfecting good roads is the lack of knowledge on the part of persons directing their improvement. It is often observed that an embankment is made where excavation would have been better and cheaper in the long run, and far better; the grades are not reduced to lowest limit commensurate with amount

of labor expended; drainage is overlooked; in fact, there is little respect for grades, drainage, or uniformity, and every man as he works out his taxes is left to make a road according to his ideas, which are sometimes very crude; he works to no fixed grade, and makes the embankments on top of high ground as well as in the bottoms, as may seem easiest.

The farmers as a rule think they can not afford the expense for services of an able engineer, and I say they can do without, if they will educate their boys in the first rudiments of road-making and in the use of an ordinary carpenter's level and tape line, which are all the instruments necessary. Let it be discussed in the common country schools, and the boys will take it to their elders, who, under any other circumstances, would probably not stop to consider this vital question. It is discouraging to farmers who have already spent a vast amount of work on their roads and yet find they have no roadbed or foundation to work on, and what has been done needs to be undone or made over all because of misdirection in the start.

In distributing the information required let the pamphlet be written in plain, simple language so that it may be readily understood by an intelligent boy, and distribute it in the country cross-road schools with instructions that it be made one of the "higher" studies. Teach the boys that railroads and steamship lines are the main arteries, and highways the lateral arteries, of commerce, and of the great importance that the latter be kept up in good condition. Instruct them at the same time how to make and maintain them and I do not know of anything that will promote faster the improvement of our highways.

(Furnished by H. C. Parker, traffic manager, Indianapolis, Ind.)

I hand you a statement of the rates at present in effect upon sand, gravel, and rough stones, carloads, distances 150 miles and less. You will note the Illinois schedule of rates is made in cents per ton on material intended for road purposes, and is lower than any other commodity, being out of the ordinary classification, and rates made equal to soft coal.

It is usual for this class of freight to be hauled very short distances, and it has been our pleasure to make concessions from time to time on gravel shipments in lots of five or more cars per day, making the price of transportation as near the actual cost as possible.

We have a special rate in effect, Noblesville to Tipton, Ind., 17 miles, \$5.50 per car. We also have rate of \$6.50 per car 35,000 pounds from Fort Recovery, Ohio, to Celina, Ohio, 15 miles, and same to St. Mary's, Ohio, 25 miles. Corresponding rates are made from Lafayette to Montmorenci, and in fact upon any application where the freight is intended for road improvements.

Memorandum of schedule rates of Lake Erie and Western Railroad covering transportation of sand, gravel, and rough stone in carloads.

[Rates in cents per 100 pounds except as noted.]

Distances.	Illinois tariff. Stone broken or gravel for making roads.	Ohio tariff.	Interstate and Indi- ana tariff.	F. W. C. & L. tariff.
Miles.	Per ton.	Cents per 100 pounds.	Cents per 100 pounds.	Cents per 100 pounds.
2½	30	2½	2½	2
5	35	2½	2½	2½
7½	45	2½	2½	3
10	45	2½	2½	3
12½	50	2½	2½	3
15	50	2½	2½	3
17½	55	3	2½	3
20	55	3	3	3
22½	60	3	3	3
25	60	3	3	3½
27½	65	3	3	3½
30	65	3	3	3½
35	70	3½	3½	3½
40	75	3½	3½	3½
45	80	4	4	3½
50	85	4	4	3½
55	87	4	4	3½
60	89	4½	4½	3½
65	91	4½	4½	3½
70	93	5	5	3½
75	95	5	5	4
80	96	5	5	4
85	97	5½	5½	4
90	98	5½	5½	4
95	99	5½	5½	4
100	100	6	6	4
110	102	6	6	4
120	104	6	6	.....
130	106	6	6	.....
140	108	6½	6½	.....
150	110	7	7	.....

ATCHISON, TOPEKA AND SANTA FÉ RAILWAY COMPANY.

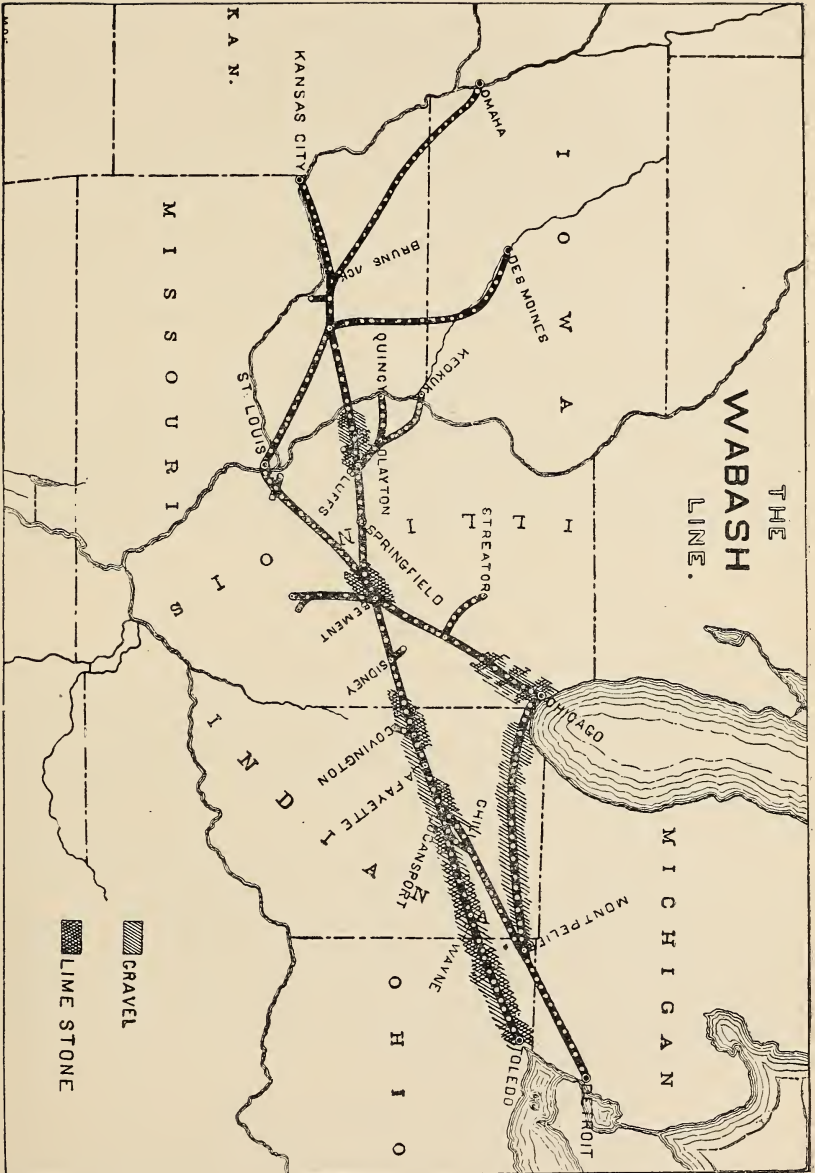
(Furnished by James Dun, chief engineer.)

Illinois.—From Streator to Chicago, 94 miles, there is an ample supply of limestone and gravel. Slag also can be secured cheaply at Joliet, and the débris from fire clay works at Streator is also available. From Streator to Chillicothe, 40 miles, no good gravel or rock has yet been discovered along the line. At Chillicothe there is a large supply of good gravel in numerous beds along the west bank of the Illinois River. Between Chillicothe and Dallas, 95 miles, but little material suitable for road-making has been discovered. Fire clay and hard-burned brick are produced at Galesburg, and vitrified brick is also used extensively for streets in that city, and large shipments made to other points. Between Dallas and Niota, 6 miles, there are good quarries of stone suitable for road-making. These quarries have, in two instances, tracks laid to them on the Pekin branch. Between Ancona and Pekin there is but a limited supply of material suitable for good roads.

WABASH RAILROAD COMPANY.

(Furnished by Charles M. Hays, general manager, St. Louis, Mo.)

(1) Along and in the vicinity of this line of road from Toledo, Ohio, to Danville, Illinois, there is generally an unlimited supply of hard carboniferous limestone and there is also in many localities quite a supply of good gravel. This gravel lies in some localities in pockets, and at other points in strata with stiff clay either on top or alternately in seams, but generally in sufficient quantity to be available for use in improving the country roads.



From Danville, Illinois, to the termini of the road at Keokuk, Iowa, Quincy, and East St. Louis, Illinois, there is scarcely any material of any sort available, except in the bluffs in the vicinity of Decatur. From Bluffs, Illinois, to the terminus on the Mississippi River at East Hannibal there are deposits of limestone and gravel in considerable quantities which could be made available. On the line from Bement to Chicago there is no material until the Kankakee River is reached, and from that point to Chicago there are quarries of limestone, usually from 3 to 10 feet below the surface, and many of the mounds and bluffs along the several creeks are composed of gravel and clay alternately, from which a great amount of good road material could be procured. On the road from Detroit to Chicago between Hamilton, Steuben County, Indiana, and Westville, La Porte County, Indiana, there are large and heavy deposits of gravel that could be made available at small expense. On the line of road west of the Mississippi River through the State of Missouri and extending into Iowa, there is very little material for making roads, no deposits of stone or gravel of any importance having been discovered. There are in some localities small deposits of coarse sand, very limited in extent, that are being used in the smaller towns, but nothing that can be considered available for general improvement of the country roads.

(2 and 3) We have no regular schedule of rates in effect on material for country highway improvement, our usual practice being to name such rates as will fit each particular case. In some instances very low rates have been made, and in others we have hauled material free with the understanding that local street officials would assume the cost of unloading and spreading the material. As a general proposition, however, we would haul this character of material on basis of cost of the service for short distances, and for longer distances on basis of one-half cent per ton per mile.

PITTSBURG, AKRON AND WESTERN RAILROAD COMPANY.

(Furnished by John H. Sample, general superintendent, Akron, Ohio.)

There is on the east end of our line a good supply of good, clean gravel, suitable for road-making purposes. On the west end of our line, at Bluffton and other points, there is a good blue limestone, which, when crushed, makes a good road-making material. We have this summer hauled from Akron and vicinity to New Washington 163 carloads of gravel, and have hauled from Bluffton to New Washington 255 cars of crushed limestone, to be used in road-making for the village of New Washington and in the territory adjacent thereto.

We have furnished, loaded, and hauled the gravel from Copley to New Washington, 70 miles, for 65 cents per ton. We have also hauled crushed limestone from Bluffton to New Washington, 56 miles, for $3\frac{1}{2}$ cents per hundredweight.

In addition to this we have hauled a number of cars from Bluffton to Vaughnsville for use on the roads. I notice there is considerable activity locally, from the quarry at Bluffton and also from another quarry at Carey. Last year we also brought in from Bluffton to Akron, to be used on the highways just outside of the city, a number of cars of crushed stone. Along the line of our road considerable activity in the matter of making good roads is noticeable.

ILLINOIS CENTRAL RAILROAD COMPANY.

(Furnished by J. F. Wallace, chief engineer, Chicago.)

There is no good road material along or near our lines that is accessible for the improvement of highways, as far as I know. In the vicinity of Galena, Kankakee, and Makanda, Illinois, there are, however, rock quarries from which crushed stone could be obtained at an expense of from 60 cents to \$1 per cubic yard, loaded on cars, owing to the quantity that might be used. This crushed stone would make

good road material. West of the Mississippi and south of the Ohio River there is no good road material immediately along our line, with the exception of the Rossetta, Louisiana, gravel pits, from which gravel is hauled to pave the streets of New Orleans.

No permanent improvement can be made in our country highways until radical changes are made in the public organizations that look after the improvements of our highways. In order to accomplish any permanent results the entire roads in one county should be under the control of the county surveyors or engineers. Money should be raised for this purpose by a direct tax, which should be collected in cash, and not in labor as at present, and this money should be expended under the general direction of the county commissioners and under the immediate direction of the county surveyors or engineers. The highways improved should in the first place be the highways leading from one town to another, and after an initial system of highways is constructed in this manner the construction of lateral and branch roads should be taken up.

Cheap improvements should be made in the flat sections of Illinois by first securing good subdrainage, by the use of tiling and suitable surface ditches. The black soil of Illinois should be disturbed as little as possible in roadmaking, simply enough to give good surface drainage. It would cost in Illinois to make a satisfactory road with the use of crushed stone from \$2,500 to \$4,000 per mile, depending upon the length of railroad haul from the different quarries. One way in which this material could be cheaply applied would be by laying tracks in connection with the leading railroads for the delivery of the stone; the track to be taken up upon completion of the improvements. If this plan were adopted to an extent to warrant taking hold of the matter in a large manner, first-class public highways might be constructed as low as \$2,500 per mile through the level portion of Illinois.

(Furnished by Stuyvesant Fish, president, Chicago.)

We have no special schedule of rates for the transportation of road materials. We have at times made reduced rates in special cases to encourage the building of roads in which our company was vitally and directly interested; but I can not at this moment give you an intelligent idea of the amount of reduction, as each case has to be taken up by itself on its merits. We have also, in several cases, paid our local tax for perhaps a year, or two years, in advance by furnishing material from the company's gravel pits and transporting the same.

I would submit that legislation should be had by the various States which will enable railroad companies to furnish material and transport the same in prepayment of taxes; that is to say, that the local authorities having charge of taxation should be authorized to accept from railroad companies road material and the transportation of the same in lieu of money for taxes *in advance* of the time when the taxes become payable. At present, the railroad companies are obliged to take the risk of contracts of this sort being repudiated by the succeeding board of assessors, and while I have never heard of a contract of this sort being repudiated, I am perfectly well aware of the risk which we run in accepting them.

As a general proposition, it would seem to me that the feasible way to work out the improvement of roads would be either for Congress to take charge of the matter under the provision of the Constitution giving to it the power to regulate "commerce among the States,"—which does not mean commerce *between* the States—and to devise a general scheme of highways based upon careful surveys taken in connection with existing routes of communication by rail and by water, and present aggregations of population in cities and towns. Or, failing this, to have each State take up the question on like broad grounds as its own interests may dictate. The

reason for the present bad condition of highways in many parts of this country seems to me to lie in the lack of coöperation over sufficient areas, each little township working in its own interests regardless of those of its neighbor, and each land-owner working out his taxes on the road at the season of the year which suits him best, and in the way which his ignorance of the importance of the subject leads him to think cheapest. While I do not profess to have any knowledge of what the best system is, I am clear that nothing could be worse than the present lack of all system.

You are perfectly right in referring to the interest uniformly shown by railway managers in the improvement of highways. Individually I have had the matter at heart for many years, and am glad to see it now taken up by the Government.

SAGINAW, TUSCOLA AND HURON RAILROAD COMPANY.

(Furnished by R. W. Roberts, city engineer, Saginaw, East Side, Mich.)

(1) At Bay Port on section 5, town 16 north, range 10 east, in Huron County, Mich., about 50 miles by the railroad from this city and 3 miles inland from the shore of Wild Fowl Bay, are located the Bay Port stone quarries with 200 acres of stone land, with an average depth of 14 feet of limestone. The quarries are supplied with a No 6 Gates stone-crusher with a capacity of 800 to 1,000 cubic yards of crushed stone per day. The crusher is provided with screens of various sizes and the stone is screened to any desired size for road material.

The stone is peculiarly adapted to the construction of macadam pavements and roads. It is tough and hard; capable of standing a crushing strain of 26,110 pounds per square inch, the greatest crushing strain of any stone on record that I know of. Its analysis also shows that it would make a fair grade of hydraulic cement, which is an invaluable property in a stone to be used in the construction of macadam streets and roads. During the past two years about 5 miles of streets and suburban roads in this city have been macadamized with this stone, and it has been demonstrated that there is no better stone for road material, especially for the improvement of country roads where an expensive system of construction and maintenance can not be adopted. The price per cubic yard of crushed stone on cars at quarry is about 85 cents.

(2) The freight rate per cubic yard from the quarries to this city is 55 cents, with a pro rata rate for other places.

(3) A reduced rate was given for this season by the railroad company of 40 cents per cubic yard from the quarry to this city and the price at the quarry was reduced to 60 cents per cubic yard. This was done jointly by the railroad company and the quarry to encourage the movement for better roads.

(4) In this State the road laws should be so amended that the highway tax now levied upon taxable property and worked out by the owners thereof upon the adjacent streets and highways should be paid in cash by the property owners into a fund to be expended for the repair and construction of highways under the direction of skilled road engineers and superintendents, who should be subordinates to a non-partisan commission appointed by the best appointive power in the State. The commission to be composed of men as far as practicable with a knowledge of road construction and maintenance, who are permitted to appoint a chief engineer of highways and bridges for the State, who would have general supervision of the plans for all highway improvements. Subordinate to the State commission there should be created, by appointment, a nonpartisan county commission, with the same power in the county as the State commission has in the State, who should appoint a county engineer of highways, subject to the approval of the State engineer. All engineers and superintendents of roads should be appointed on account of their fitness, and hold office during the pleasure of the commission and their continued fitness for the service. The U. S. Government should, jointly with the State, construct cer-

tain State roads. The State should, jointly with the counties, construct certain county roads. Then each county in which the "county road system" is adopted should improve the public highways. One-half the expense should be paid by property especially benefited and one-half by a county tax, less the amount available from the highway tax not required for the maintenance of public roads. All work should be done by contract.

(Furnished by W. L. Webber, president, Saginaw, East Side, Mich.)

In addition to Mr. Roberts's suggestions and recommendations, I would state: The constitution of Michigan was amended by a vote of the people during the past year, pending the last session of the legislature of Michigan. After this amendment had been adopted the legislature of Michigan passed an act, which was approved May 26, 1893, and ordered to take immediate effect, entitled "An act to provide for a county and township system of roads, and to prescribe the powers and duties of the officers having the charge thereof."

By the terms of this act the board of supervisors of the county, by a two-thirds vote, may submit to the people of the county the question as to whether the county system shall be adopted or not. Pursuant to this at the October session of the board of supervisors of the county of Saginaw, by the required vote, it was submitted to the people to vote upon this question at the election to be held in April, 1894, at which time it is believed the county road system will be adopted for Saginaw County. Bay County has already adopted the county system, and their commissioners have been appointed pursuant to the new law. How many other of the counties in Michigan have adopted this or submitted it to the people to be voted on I can not state. Grand Traverse County submitted the question at a special election, and by a majority vote the county road system was not adopted.

As to road materials, there are scattered over large portions of the State of Michigan, upon the farms and farming lands, a large number of granite boulders or "hard heads," commonly called, which make good roads and can be broken up for that purpose by portable stone breakers or otherwise.

The roads could be very much improved by more efficient drainage if the county road system could be adopted so that the levels for a long distance could be taken and proper water courses utilized. Even under the township system better drainage would give greatly increased value to the dirt roads, particularly in level portions of the State and on clay soils.

Another improvement might be made in our highways and greatly for the benefit of the public by running highways on straight lines from point to point. The custom has been to follow section lines in laying out the highways, and of course these turn at right angles so that a party living, say, at the northeast corner of the county, with the county seat in the center thereof, travels by a highway, laid at right angles. In other words, he traverses the base and perpendicular of the triangle instead of traveling the hypotenuse. When good roads are made it is an advantage that they should be upon the main line, and do the greatest good for the shortest mileage. It would be a great improvement in square counties if a highway could be laid from each corner to the center; that is, assuming the county seat to be in the center, approximately it would shorten the distance from nearly all parts of the county and, of course, shorten the mileage to be constructed.

WABASH, CHESTER AND WESTERN RAILROAD COMPANY.

(Furnished by C. B. Cole, vice-president, Chester, Ill.)

(1) There is an inexhaustible supply of limestone of superior quality for road purposes on this line. It is loaded on cars for 32½ cents per cubic yard, crushed and screened ready for use.

(2) We are making rates of about $\frac{1}{2}$ cent per ton per mile to connecting railroads for ballast.

(3) There has been very little demand so far for it for highway purposes. For such as there has been, we have made very low rates, and for general use we would make rates at bare cost of hauling, or less.

(4) The chief need to insure good permanent roads is a proper knowledge of the best way to make the roads of a permanent character. The average country authorities have no idea of the necessity of employing a competent engineer to see that the work is properly done, and unless it is the money expended is little better than wasted. When they begin right and make some roads as they should be made, and the people learn their value, the money will be voted to build a general system of permanent roads.

ST. LOUIS, ALTON AND TERRE HAUTE RAILROAD COMPANY.

(Furnished by George W. Parker, president, St. Louis, Mo.)

The only road materials along or near the lines of this company are limestone and sandstone. We have a good limestone quarry in the Mississippi River bluffs, between Belleville and Carondelet, on what is known as the Carondelet Branch, where we maintain crushers, and get broken stone for ballast. On the Paducah Division, in Johnson County, there are large deposits of sandstone, which could be utilized for road improvements.

There have been no efforts at road improvements in the neighborhood of our line, except in villages where we have granted reduced rates to encourage street improvements. We would be glad to do likewise as to road improvements in the counties abutting on our line.

PEORIA, DECATUR AND EVANSVILLE RAILWAY COMPANY.

(Furnished by R. B. Starbuck, superintendent, Mattoon, Ill.)

We have located at Mackinaw Falls, a point 18 miles out from Peoria, a very fine deposit of gravel situated in a chain of bluffs running at right angles with our track, and extending perhaps a mile or a mile and a half, presenting a square face or good clean gravel ranging from 20 to 40 feet in depth. This gravel has in its composition a limited per cent of cement, which has a tendency to make it pack solidly. During the past summer we used 400 carloads of this gravel for street paving at Mattoon with very satisfactory results. The contractor owns several acres of this land, and it is his and our purpose during the present season to canvas our line most thoroughly with a view of including the different cities and villages to use considerable quantities of it in grading and paving. South of this pit 1 mile there is another very fine deposit of gravel lying on this company's right of way and extending at right angles with the track beyond the right of way for a distance of one-quarter or one-half a mile. This gravel has a depth of 8 to 15 feet. It is also considerably impregnated with cement and we find it makes a very fine ballast for track and highways. South of Mattoon 12 miles, and lying between 5 or 6 miles from the track, is another large deposit of gravel which is of a much coarser quality. I have never examined this gravel, but am informed that there is in the neighborhood of 100 acres of it which has a depth of 15 to 20 feet. There are other points on our line which bear evidences of deposits, and it is our intention, at no distant date, to sink test-pits at various points. It is the purpose of our freight department to be in such close touch with the owners of this gravel as to bring it on the market at such figures as will produce a market for it.

It has been our custom, and one that I wish to continue, to furnish transportation to parties working with us to this end. The gravel referred to above as having been used at Mattoon during the past season was loaded on cars at the expense of \$1.50 per car containing from 16 to 18 cubic yards.

MILWAUKEE AND SUPERIOR RAILWAY COMPANY.

(Furnished by Winfield Smith, president, Milwaukee, Wis.)

This railway runs to three quarries of limestone in the northern portion of Waukesha County, some 15 miles from this city, which can supply an excellent crushed stone in large quantity, very suitable for highways. The price, delivered on the cars, is \$1 per cubic yard. The railway freight from the quarry to Milwaukee is 3 cents per 100 pounds, and is 4 cents per 100 pounds to Chicago. There are no reduced rates.

LOUISVILLE, NEW ALBANY AND CHICAGO RAILWAY COMPANY.

(Furnished by W. H. McDoel, general manager, Chicago, Ill.)

(1) The only good road-making material to be found along our line consists of gravel and stone. The former is found in large quantities between Brookston and Greencastle, a distance of 73 miles, and from Monticello to Indianapolis, a distance of 85 miles. This is bank gravel and has good cementing or bonding qualities, with very little, if any, small stone, and in regions where it is found some of the best roads for all seasons of the year have been built. I refer particularly to highways in Clinton, Putnam, Carroll, Tippecanoe, and Montgomery counties. The banks of this gravel are so frequent and contain such large quantities within the limits named, that by the ordinary process of teaming very little haul is required. The gravel needs no preparation, and the average cost, put on cars, is from 35 to 50 cents per cubic yard. Stone of a quality adapted to public road-making is found in general between Greencastle and New Albany, a distance of 210 miles, and between New Orleans and French Lick Springs, a distance of 18 miles. Spalls from the oölitic limestone quarries, which are numerous between Greencastle and New Albany, can also be used to advantage in building roads, providing the bases of the roads are made of a larger stone, or the telford type. This is necessary for the reason that the limestone is soft and possesses no cementing qualities. The stone near Putmanville and that near Salem is particularly well adapted for top dressing for any stone road, and where track facilities are convenient can be broken and put on cars at a price ranging from 50 to 75 cents per cubic yard. This would be superior to gravel for hilly countries.

(2) To answer this inquiry I inclose copy of our local freight tariff, and refer you to carload coal rates, which is applicable to stone under the ordinary course of shipment. But under conditions outlined in inquiry (3) we would reduce the rates named one-half.

(4) I have no information to give in answer to this inquiry further than contained in the above.

Local freight rates for road-making materials on the Louisville, New Albany and Chicago Railway Company.

Miles.	Car loads, cents per 100 pounds.	Miles.	Car loads, cents per 100 pounds.
1 to 10	60	60 to 70	100
10 to 15	65	70 to 80	105
15 to 20	70	80 to 90	110
20 to 25	75	90 to 100	115
25 to 30	78	100 to 125	120
30 to 35	80	125 to 150	130
35 to 40	84	150 to 200	140
40 to 45	87	200 to 250	150
45 to 50	90	250 to 300	160
50 to 55	93	Over 300	170
55 to 60	96		



OHIO CENTRAL LINES.

Toledo and Ohio Central Railway Co.; Kanawha and Michigan Railway Co.; Toledo, Columbus, and Cincinnati Railway Co.

Mr. J. M. Ferris, general manager of the Ohio Central lines, incloses the information that follows, and adds:

"It has been, and is the policy of these lines, particularly in the State of Ohio, where special efforts are being made to improve the highways, to encourage this movement by giving low rates of freight and facilities for handling road material."

(Furnished by Clifford Buxton, chief engineer, Toledo, Ohio.)

In Wood County are large deposits of limestone which can be crushed, screened, and placed on cars for about 50 cents per cubic yard. This is true of both divisions of our road. On the eastern, or Bucyrus division, there is no available material except small deposits of gravel in creeks, until we reach Licking County, where there are large quantities of gravel which can be placed on cars at a cost of not to exceed 15 cents per cubic yard. There is some gravel to be had in the southern portion of Fairfield County, but not very accessible to the railroad. Considerable has been done in the way of making gravel roads in the vicinity of Pleasantville and Rushville. Near New Lexington, in Perry County, is a flinty stone locally known, I think, as chert. It makes a very durable road, but I am not familiar with the amount of it nor its accessibility. There seems to be nothing else in Perry County except sandstone, and this does not make a very good road owing to its ready disintegration. Some attempts at road-making have been made in this county by building a foundation of sandstone bowlders and covering with sand and gravel hauled from the creeks, but it does not abound in sufficient quantities for the practice to become general. In the southern portion of Athens County may be had fossil limestone which could be crushed and put on cars at about the same rate as in northern Ohio. Through Meigs and Gallia counties to the Ohio River I know of nothing suitable for roads unless it be gravel in the bed of the river, which is difficult to obtain, owing to the high banks and trouble from water.

In West Virginia there seems to be nothing but sandstone. It is, however, somewhat better than that in Ohio, being closer grained and harder. There is little or no attempt at road-making in that section of the State through which we pass, many of the roads being but little better than pathways along the mountains.

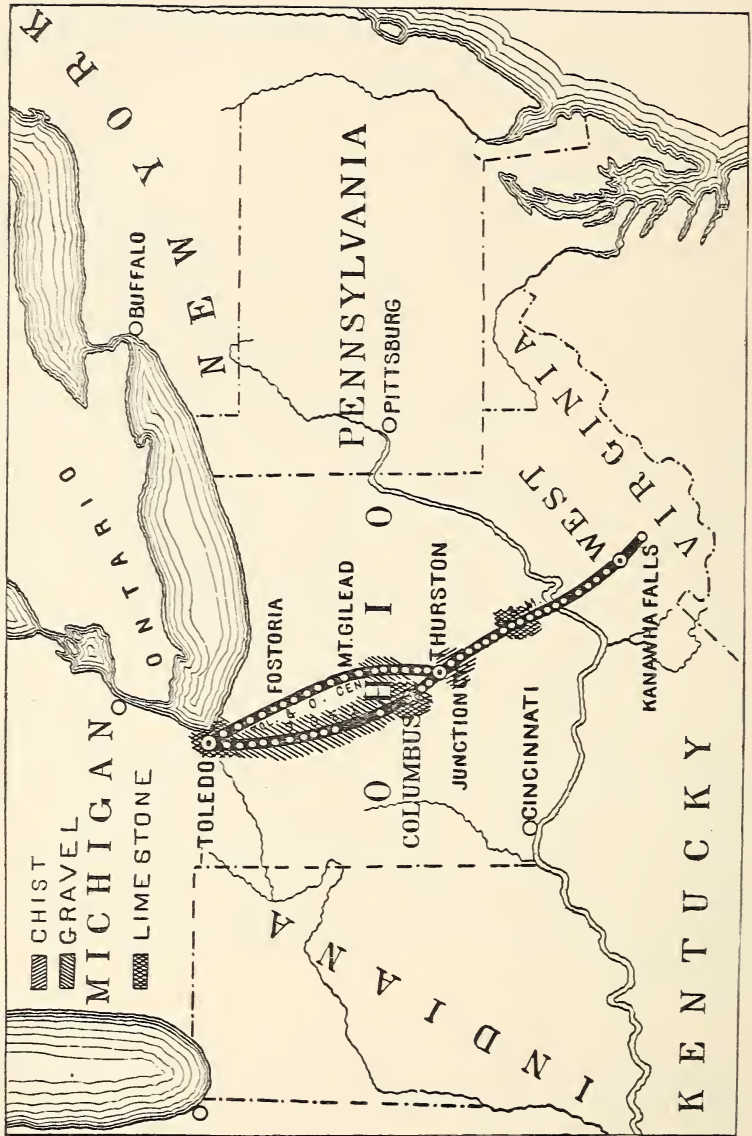
On the western or Columbus division there are large deposits of gravel, and very much has been done in Hardin and Union counties by hauling it in wagons. It can be had in almost endless quantities and readily loaded in cars at a cost not exceeding 15 cents per cubic yard. Near Columbus, in Franklin County, there is plenty of limestone, much of which is being quarried, crushed, and distributed in various portions of the county for roads.

(Furnished by Hudson Fitch, general freight agent, Toledo, Ohio.)

We have hauled a good deal of crushed stone for road purposes to points in northern and central Ohio at the following rates:

From—	To—	Rate per ton.
		<i>Cents.</i>
Lime City, Ohio	Toledo and intermediate points	30
Lucky, Ohio	do	30
Do.	Fostoria	30
Do.	Mount Gilead, Ohio, and intermediate points south of Fostoria	40
Lime City, Ohio	Findlay and intermediate points	30

OHIO CENTRAL LINES



In addition to the above we have hauled large quantities from Columbus to Truro at rate of \$5.75 per car, equal to about 25 cents per ton, this charge being in addition to a local charge from the quarries on the Pan Handle and Midland roads into Columbus of about the same amount. These rates are much less than our current rates upon other kinds of stone, averaging about two-thirds our stone rates.

INDIANA, ILLINOIS AND IOWA RAILROAD COMPANY.

(Furnished by T. P. Shonts, general manager, Chicago, Ill.)

(1) We have stone in abundance located at Carrow and Kankakee, Illinois, which is now accessible for loading on cars. Also a large quantity at Momence, which can be reached by the construction of a siding. This stone could be furnished and loaded on cars for 50 cents per cubic yard.

(2) The schedule rate on stone from these points west to Streator and intermediate points is 40 cents per ton; east to Shelby, Indiana, and intermediate points, 60 cents; to Wheatfield, Indiana, and points east of Shelby, 75 cents; to San Pierre and points east of Wheatfield, 80 cents; to Knox and points east of San Pierre, \$1.

(3) We have offered to haul this stone free for the citizens of Dwight to improve the roads between our depot and the town, provided they paid for the same loaded on our cars; and we are at all times ready to coöperate with any road commissioners in our territory by making low rates on this commodity for the purpose of road improvement.

CHICAGO AND EASTERN ILLINOIS RAILROAD COMPANY.

Mr. H. E. Felton, general freight agent, sends a communication from the chief engineers of the Chicago and Eastern Illinois Railroad Company, and says:

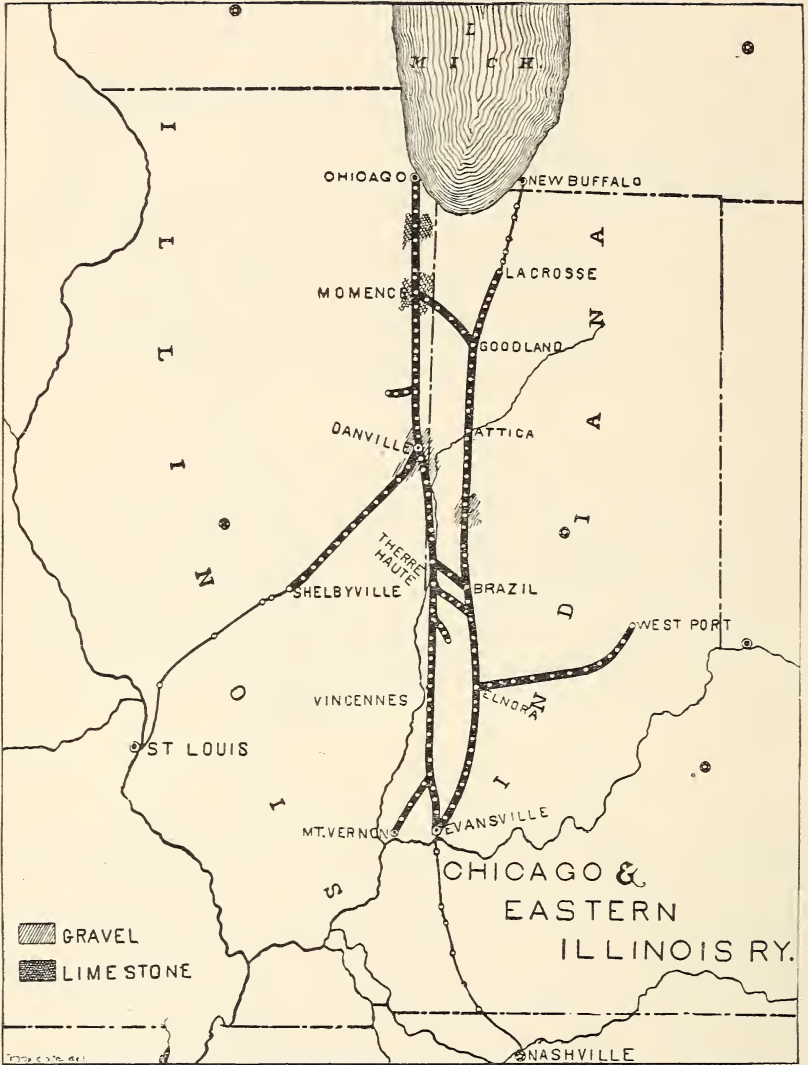
This company fully appreciates the commercial necessities of good highways, and does everything in its power to assist in the construction of same. We make very low rates on paving brick, crushed stone, etc. For example, Mr. Baldwin speaks of the paving brick made at Clinton. Our rate from Clinton to Chicago, a distance of 163 miles, is 72.5 cents per ton. Our rate from Thornton, Illinois, to Chicago, a distance of 22 miles, on crushed stone is \$6 per car. This gives you a good idea of our long-haul and short-haul rates.

(Furnished by H. F. Baldwin, chief engineer, Chicago, Ill.)

Along the line of our road there is excellent material for road-making. Probably the best material that we have is paving brick, which is manufactured at Clinton, Indiana, Brazil, Indiana, and Veedersburg, Indiana. I do not know what this paving brick costs per thousand, but think about \$12. I do know, however, that several contracts for street paving have been made at about \$1.65 a square yard.

At Thornton, Illinois, there is a large quarry, and a great deal of limestone is taken out every year and crushed, which would make excellent road material. The price of this stone per cubic yard on cars at Thornton is \$1, but if large quantities are bought, I think it can be gotten at least 10 cents a yard cheaper than that.

At Momence, where our line crosses the Kankakee River, a great deal of limestone has been taken out of the bottom of the river during the past few months and piled close to our tracks, where it can be easily and cheaply loaded on cars. This limestone was taken out in order to lower the channel of the river and secure better drainage for farm lands. I am sure that the contractor who owns this stone would be willing to crush it and load it on cars at a low price in order to realize something from it. If a large quantity of it is bought, I think it can be gotten at, say, 60 cents per cubic yard.



There is a great deal of very excellent gravel on the line of our road at several places. We have a large gravel pit at Lyford just south of the crossing of our main line with the Wabash Railroad. We also have a smaller pit at Grape Creek, Illinois, which is about 4 miles from Danville on our St. Louis division, and another pit on our Brazil division near Mecca, Indiana.

We have shipped a great deal of gravel for towns, and in small quantities have sold it at \$2 per car, loaded, estimated at 10 yards at the pit. At present we are furnishing some contractors who are working on the roads out of Brazil, Indiana, a large quantity of gravel from our pit at Lyford which contractors themselves load. We are making them no charge for the gravel. I think, however, that it is costing them about 10 cents a yard to load it.

CLEVELAND, CINCINNATI, CHICAGO AND ST. LOUIS RAILWAY COMPANY.

(Furnished by George W. Kittredge, chief engineer, Cincinnati, Ohio.)

From Cleveland to Columbus we have no gravel to speak of, but a great number of quarries, which get out principally sandstone for building purposes. They have, however, a great deal of spalls, which are suitable for road-making.

From Columbus to Cincinnati the road is well supplied with both gravel and limestone quarries, which are easy of access and furnish good quality of both materials for roadmaking.

From Cincinnati to Indianapolis the road is well supplied with gravel and limestone, all of which is very easy of access.

From Indianapolis to Kankakee there are no quarries and but very little gravel, except in the vicinity of Lafayette and the Wabash River.

From Indianapolis to East St. Louis the road is well supplied with gravel, but no stone to speak of, except near the Mississippi River territory, where there is limestone.

From Galion to Indianapolis, the road is well supplied with gravel, but little stone.

From Danville to Cairo, there is no stone or gravel, except in a few localities where gravel can be had from beds of rivers and creeks.

From Benton Harbor to North Vernon, the road is well supplied with gravel, but little stone.

In all of the above-named localities, where either of these commodities are found, they are of good character and very accessible. The average cost of crushed stone is 75 cents to \$1 per cubic yard, f. o. b. cars. Gravel will cost on an average from 40 to 50 cents per cubic yard, f. o. b. cars.

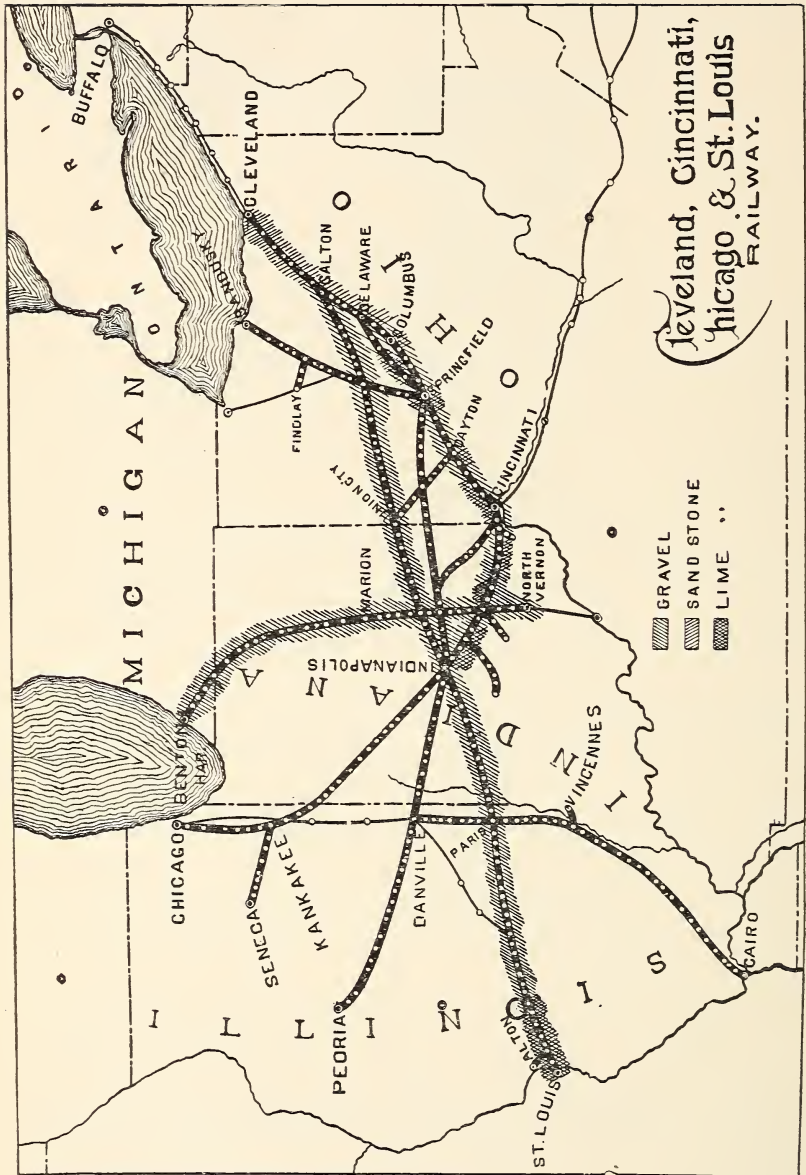
Both of these commodities are classified in the freight classification as sixth class, and the average freight rate is 0.4 cent per mile per hundred pounds, special rates being made upon large shipments.

CHICAGO, BURLINGTON AND NORTHERN RAILROAD COMPANY.

(Furnished by George B. Ham, second vice-president, Chicago, Ill.)

The highways adjacent to the line of our road mostly run along the sides of the bluffs, or are cut through the hills. There are gravel pits at several points along the line, notably at Prescott and Hager, in Pierce County, Wisconsin, at Cassville, in Grant County, Wisconsin, and at Hazlehurst and Oregon in Ogle County, Illinois. The materials from these pits make fair roadbeds, its cost being from 15 cents to 20 cents per yard, loaded on cars or wagons.

Good limestone crops out in abundance all along the line from Prescott, in Pierce County, Wisconsin, to Savauna, Carroll County, Illinois, and at nearly all points it is convenient for loading on cars or wagons. The cost of getting it out, crushing and loading it on cars or wagons, would be from 65 cents to 85 cents per cubic yard.



The greater part of the rock breaks with clean, sharp edges, and would, no doubt, make an excellent roadbed if properly used.

(2) Following are our schedule rates for transporting the material in carload lots:

Miles.	Cents per cwt.
Over 5 and under 15.....	3
Over 15 and under 20.....	4
Over 20 and under 25.....	4½
Over 25 and under 35.....	5
Over 35 and under 40.....	5½
Over 40 and under 45.....	5
Over 45 and under 65.....	6½
Over 65 and under 110.....	7

(3) As we have had no applications for special rates on material to be used in high way construction none have been made.

FLINT AND PERE MARQUETTE RAILROAD COMPANY.

(Furnished by M. H. Harding, general manager, Saginaw, Mich.)

Your circular letter asking for reply on four questions is received. Our answer to these questions is as follows:

(1) Good road material—beds of gravel, sand boulders—are abundant in the State of Michigan, and pretty uniformly distributed. On main line of Flint and Pere Marquette they are located at Northville, Milford, Clyde, and Hersey; on Port Huron division, near Vassar, Brown City, and Bad Axe.

The cost of loading on cars by hand would be 15 cents per cubic yard. If loaded in large quantities and loaded with steam shovel, it should be done for 6 to 10 cents per cubic yard.

(2) We should be glad to encourage good road-building by making the rates equal to the actual cost of handling this material.

(3) We have offered various communities to haul gravel at actual cost.

(4) I give as an answer to this question the comments of Mr. W. B. Sears, our chief engineer, who is a competent roadbuilder and a thorough believer in "sub-drainage:"

"I have given this subject much study for years, and the best method I can suggest is this, viz, instruct the ignorant how to use the material at hand in the basal principles of road-making. And among all the writers on roads and how to make them in the United States to-day, I know of none so instructive and captivating as James B. Olcott, of South Manchester, Conn. Let the Commissioner of Agriculture employ him to prepare an essay on roads, with diagrams and illustrations showing false and correct sections, and his "methods" of drainage, covering 100 to 150 pages; print in pamphlet form at cost and scatter them broadcast throughout the country. The stupidity and ignorance of the average man on the subject of road construction surpasses my comprehension. To secure good common roads in Michigan (and even railways) about all we need is thorough surface and subdrainage. This the average man neglects, and hence we are all swamped in mud."

PENNSYLVANIA LINES WEST OF PITTSBURG.

(Furnished by Joseph Wood, general manager, Pittsburg, Pa.)

In reply to your circular letter of October 16, 1893, I submit herewith answers to your inquiries:

1. Supply, location, and cost of road materials.

Please see accompanying map, marked "A," showing Pittsburg, Cincinnati, Chicago and St. Louis Railway lines, with location of deposits of road materials; gravel indicated in red line, stone in blue. At the points shaded in red and blue lines road materials exist in large quantities and are accessible.

The cost of preparation and loading on cars is approximately as follows:

Road material—Cost per cubic yard.

[Loaded on cars, Pittsburg, Cincinnati, Chicago and St. Louis Ry.]

Location.		Gravel.	Crushed limestone.
Pittsburg division	Pen Twyn	\$0.09	.....
Chartiers division	Hastings		\$0.70
	Rendcomb .....	.75	.....
	Batavia Junction .....	.35	.....
	Terrace Park .....	.35	.....
	Loveland .....	.35	.....
Cincinnati division	Salt Run .....		.95
	Waynesville	About .15	.....
	Cedarville .....		.50
	Dayton .....	.35	.90
	Springfield .....		.75
	Columbus, Ohio .....		.60
	do .....		.50
Indianapolis division	Cable .....	.10	.....
	Covington, Ohio .....		.75
	Weavers .....	.10	.....
	New Paris .....		.75
	Seven Mile, Ohio .....	.07	.....
Richmond division	Eaton .....		.....
	Anderson, Ind. ....	.10	.....
	Kokomo, Ind. ....		.90
	Ridgeville, Ind.		1.10
	Marion		1.15
Chicago division	Logansport .....	.08	.....
	Kenneth .....		.60
	Curveton .....	.08	.....
	Monticello .....	.40	.....
	Kentland		1.10
	Columbus, Ind. ....	.20	.....
Louisville division	Sellersburg, Ind. ....		.60
	North Vernon, Ind. ....		.75
	Vernon, Ind. ....		.85
	Romona, Ind. ....		.50
Indianapolis and Vincennes division	Spencer, Ind. ....		.55
	Worthington, river Pits .....	.20	.....
	Vincennes, Ind. ....	.20	.....

The above are locations which are near the railroad and in some instances include those which are not now provided with side-track facilities.

2.—Schedule rates for transportation of road materials.

[In car loads; rate per 100 pounds.]

Distance.	Gravel.	Crushed stone.
		<i>Cents.</i>
5 miles and under	No schedule rates.	2 $\frac{1}{2}$
5 to 10 miles		2 $\frac{1}{2}$
12 $\frac{1}{2}$ miles and under		3
12 $\frac{1}{2}$ to 15 miles		3 $\frac{1}{2}$
15 to 20 miles		4
20 to 25 miles		4 $\frac{1}{2}$
27 $\frac{1}{2}$ miles and under		5
27 $\frac{1}{2}$ to 30 miles		5 $\frac{1}{2}$
30 to 35 miles		5 $\frac{3}{4}$
35 to 42 $\frac{1}{2}$ miles		6
42 $\frac{1}{2}$ to 52 $\frac{1}{2}$ miles		6 $\frac{1}{2}$
52 $\frac{1}{2}$ to 62 $\frac{1}{2}$ miles		6 $\frac{1}{2}$
62 $\frac{1}{2}$ to 77 $\frac{1}{2}$ miles		7
77 $\frac{1}{2}$ to 87 $\frac{1}{2}$ miles		7 $\frac{1}{2}$
87 $\frac{1}{2}$ to 150 miles		8
150 to 200 miles		9

NOTE.—These apply only now on P., C., C. & St. L. Rwy.

On the Northwest system of the Pennsylvania lines west of Pittsburg, road-making material can be obtained as follows:

Gravel, in limited quantities, can be obtained at the following points, and at approximately the following prices:

Location.		Cost.
Pittsburg, Fort Wayne and Chicago Rwy.	Adams, Ind	
	Larwill, Ind	50 cents per cubic yard, f. o. b.
	Arcola, Ind	\$1.25 per cubic yard, f. o. b.
	Atwood, Ind	8 cents per cubic yard, at pit.
	Pierceton, Ind	
	Bucyrus, Ohio	
	Robinson, Ohio	15 cents to 20 cents per cubic yard.
	Upper Sandusky, Ohio	60 cents per cubic yard, f. o. b.
	Maples, Ind	\$1 per cubic yard, f. o. b.
	Bourbon, Ind	\$300 per acre for gravel.
Cincinnati and Portsmouth R. R.	Warsaw, Ind	\$50 per acre for land.
	Etna Green, Ind	\$1 per cubic yard, f. o. b.
	Earlville, Ohio	\$1 per car.
	Smiths Ferry, Pa.	Do.
	Brilliant, Ohio	Do.
Pittsburg, Youngstown and Alleghany R. R.	Wegee, Ohio	Do.
	Minerva, Ohio	\$3 per car, loaded.
	New Brighton, Pa.	25 cents per cubic yard.
	Mahoningtown, Ohio	Do.
Erie and Pittsburg R. R.	Between Youngtown, Ohio, and Eagleville, Ohio.	Do.
	Ashtabula, Ohio	Do.
Toledo, Walhonding Valley and Ohio R. R.	Between New Castle, Pa., and Erie, Pa.	Do.
	Greersville, Ohio	
	Wolfs Pit, Ohio	
	Brownstool, Ohio	\$125 per acre for gravel.
	Warsaw Junction, Ohio	

Limestone can be obtained at the following points, and at approximately the prices given:

Location.		Cost.
Pittsburg, Fort Wayne and Chicago R. Rwy.	Middlepoint, Ind	60 cents to 85 cents per cubic yard at quarry.
	Lima, Ohio	70 cents per cubic yard at quarry.
	Auglaize, Ohio	75 cents per cubic yard at quarry.
	Delphos, Ohio	60 cents per cubic yard at quarry.
	Forest, Ohio	
	Van Wert, Ohio	
	Leesville, Ohio (broken sandstone).	50 cents f. o. b. at quarry.
	Pipe Creek, Ohio	90 cents to \$1 per cubic yard, f. o. b.
Cleveland and Pittsburg R. R.	Empire, Ohio, broken sandstone.	Little more than cost of breaking.
	Rush Run, Ohio, broken sandstone.	Do.
	Wheelock, Ohio, broken sandstone.	Do.
Pittsburg Youngstown and Ashtabula R. R.	Ellwood, Pa.	\$1 per cubic yard, f. o. b.
	Wampun, Pa.	Do.
	Mahoningtown, Pa.	Do.
	Hilltown, Pa.	Do.
Erie and Pittsburg R. R.	Bessemer, Pa.	Do.
	New Castle, Pa.	Do.
Toledo, Walhonding Valley and Ohio R. R.	Bloomville, Ohio	

Furnace slag.—This is most excellent road-making material, and can be obtained in large quantities from the furnaces in the Mahoning and Shenango valleys, the prices ranging about as follows:

Location.		Cost.
Cleveland and Pittsburg R. R.	Cleveland, Ohio	\$3 to \$5 per car.
	Canal Dover, Ohio	Do.
	Steubenville, Ohio	Do.
	Mingo Junction, Ohio	Do.
	Bellaire, Ohio	Do.
Pittsburg, Youngstown and Ashtabula R. R.	Niles, Ohio	\$1 per car.
	Girard, Ohio	Do.
	Brier Hill, Ohio	Do.
	Youngstown, Ohio	Do.
	Haselton, Ohio	Do.
Erie and Pittsburg R. R.	Struthers, Ohio	Do.
	Lowell, Ohio	Do.
	New Castle, Pa.	Do.
	Middlesex, Pa.	Do.
	Sharon, Pa.	Do.
State Line and Indiana City Rwy.	Sharpville, Pa.	Do.
	Hammond, Ind.	10 cents per cubic yard.

3.—REDUCED RATES MADE FOR ROAD MATERIALS TO BE USED IN THE IMPROVEMENT OF HIGHWAYS.

Practically nothing has been done in this direction.

This company is favorably disposed to encourage the building of good public roads, and will render what aid it consistently can.

4.—SUGGESTIONS, RECOMMENDATIONS, ETC.

In my opinion, a general interest would be created by the adoption and distribution of topographic maps of each county, showing the railroads, highways, towns, principal streams, section lines, and deposits of stone and gravel. These will be valuable to county officials and others in charge of road improvements; unimproved highways to be designated by two parallel lines, and improved highways by heavy black lines, additions to be made to the latter from time to time as improvements are made. See map (marked B) of Greene County, Ind., showing improved and unimproved roads January 1, 1894.

Example.

Greene County, Ind., has 721 miles of highway, of which 16 miles are improved.	3 per cent
Marion County, Ind., has 542 miles of highway, of which 193 miles are improved.	36 per cent

Maps of each county should be made and all bound in one book, each State separate; should be on a scale of about half inch to the mile, 1: 125,000 or 1: 150,000, which would make a book about 16 by 20 inches. Embraced in this book there should be plates of cross sections, showing manner of constructing the different kinds of highways, gravel, stone, drainage, etc., with dimensions. General specifications and estimated quantities of materials should also be included, say for 1 mile of road.

I think it would be well to incorporate in the work the more important State laws relating to road construction, and some statistics showing cost of maintaining highways. (In Indiana, in 1892, on about 60,000 miles of highway, over \$3,000,000 were expended in repairs, an average of about \$50 per mile.)

As a rule, each county has a published map, atlas size, giving the location and number of highways, etc. This and other necessary data could be obtained from county auditors or surveyors by correspondence. In preparing this book, the prin-

cial work would be that of draftsman, in making the drawings and publication, which could be done in a short period and at no great cost.

Such a book, with the proposed map system, will furnish a means of comparison engender a spirit of emulation, and awaken a desire on the part of county officials, road commissioners, and landowners to improve highways. They should be distributed to each county, and copies furnished to township libraries.

In our opinion, a keener interest can be awakened and better results accomplished, particularly in the agricultural districts, through the agency of the U. S. Department of Agriculture than by any other means.

THE SALEM R. R.

(Furnished by B. S. Amble, president.)

In reply to your inquiry I beg to say that the Salem Railroad will carry road material at "bare cost of handling."

In this connection I wish to advise you that we have upon our road the only gravel suitable for making roads within a radius of 30 miles.

I will be glad to coöperate in the movement in any way I can.



